Quantum
MEDICAL IMAGING, LLC

Model QS-500 Series

Floor-to-Ceiling/Wall Tubestand

Installation and Operation Manual

Manual Part No. DC30-005 Revision B

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REVISION HISTORY

REVISION	DATE	TYPE OF MODIFICATION
A	10/18/00	Initial Release.
B	2/15/00	Added UL Mark

LIST OF EFFECTIVE PAGES

Page Number	Rev	Page Number	Rev	Page Number	Rev
i - x	B				
1 - 44	B				

Revision History

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Table of Contents

Section 1, Introduction	1
Section 2, Specifications	5
Section 3, Assembly & Installation	11
Section 4, Operation	31
Section 5, Maintenance	37

Table of Contents

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WARNING

Quantum Medical Imaging, LLC disclaims all responsibility from any injury resulting from improper application of this equipment.

This equipment is sold to be used exclusively under the prescribed direction of a person who is licensed by law to operate equipment of this nature. This equipment must be used in accordance with all safety procedures described in this manual and must not be used for purposes other than those described herein.

Quantum Medical Imaging, LLC cannot assume responsibility for any malfunctioning of this equipment resulting from improper operation, maintenance, or repair, or from damage or modification of its components.

Failure to observe these warnings may cause serious injuries.

X-RAY PROTECTION

X-rays are hazardous to both patient and operator unless established safe exposure factors and operating instructions are observed.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Suite 800, Bethesda, Maryland 20814-3095 (www.ncrp.com), and of the International Commission on Radiological Protection (www.icrp.org), and take adequate steps to protect against injury.

X-ray equipment may cause injury if used improperly. The instructions contained in this manual must be read and followed when operating this unit. Personal radiation monitoring and protective devices are available. You are urged to use them to protect against unnecessary x-ray exposure.

REGULATORY COMPLIANCE

The Model QS-500 Tube Stand is not a CDRH certifiable product. However, it must be compatible and operate in conjunction with other components in the x-ray system so that the x-ray system performs in compliance with H.E.W. Performance Standards. This product has been factory tested to assure its required performance in an x-ray system.

Those responsible for the planning of x-ray equipment installations must be thoroughly familiar and comply completely with NCRP Report No. 49, "Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies up to 10 MeV", as revised or replaced in the future. Those authorized to operate, test, participate in or supervise the operation of the equipment must be thoroughly familiar and comply completely with the currently established safe exposure factors and procedures described in publications such as Subchapter J of Title 21 of the Code of Federal Regulations, "Diagnostic X-Ray Systems and Their Major Components," and NCRP Report No. 102, "Medical X-Ray, Electron Beam and Gamma Ray Protection for Energies Up to 50 MeV—Equipment Design and Use" as revised or replaced in the future.

Scheduled maintenance is essential to the assurance of continued integrity of this equipment with respect to regulatory compliance. The continuance of certified performance to the regulatory standard is incumbent upon the user's diligent conformance to recommended maintenance instructions.

This product has been classified as Class I, Type B by Underwriters Laboratories, Inc. Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or with nitrous oxide.

c UL

MEDICAL ELECTRICAL EQUIPMENT
WITH RESPECT TO ELECTRIC SHOCK, FIRE,
MECHANICAL HAZARDS ONLY
IN ACCORDANCE WITH CAN/CSA C22.2 NO. 601.1
98YA

UL

MEDICAL ELECTRICAL EQUIPMENT
WITH RESPECT TO ELECTRIC SHOCK, FIRE,
MECHANICAL HAZARDS ONLY
IN ACCORDANCE WITH UL 2601-1
98YA

The following symbols may be used for marking on this equipment or equipment documentation:

Earth (ground)

Protective Earth (ground)

Type B equipment

Attention, consult accompanying documents

WARRANTY STATEMENT

Quantum Medical Imaging, LLC (herein known as "QMI") warrants to buyer that any new product manufactured by QMI will be free from defects in material and manufacturing and conform substantially to applicable specifications in effect on the date of shipment when subjected to normal, proper and intended usage by properly trained personnel.

All QMI products shall be warranted for a period of 12 months from the time of original installation, the date of which will be determined by a completed, returned warranty card, which must be returned within 30 days of system installation. In no case shall the warranty exceed 15 months from the date of shipment. If the warranty card is not returned to QMI, then the warranty shall take effect 12 months from the date of shipment by Quantum Medical Imaging. Buyers should complete one (1) form per system or component, if items are ordered separately.

WARRANTY CARD

Cut along dashed line

Name of Owner _____

Name of Facility _____

Address 1 _____

Address 2 _____

City _____ State _____

Country _____ Zip _____

Phone _____

e-mail _____

Name of Distributor _____

Installation Date _____

Check Type of Equipment and Provide ID No.'s:

	Model No.:	Serial No.:
☐ HI-Freq. Generator		
☐ Table		
☐ Collimator		
☐ Hi-Tension Cable		
☐ Tube		
☐ Tube Stand		
☐ Wall Stand		
☐ Other		

Fill in and mail above card promptly to:

Quantum Medical Imaging, LLC
2905 Veterans Memorial Highway
Ronkonkoma, N.Y. 11779

WARRANTY STATEMENT (CONTINUED)

Any component furnished without charge to Buyer/Dealer during the warranty period to correct a warranty failure shall be warranted only to the extent of the unexpired term of the warranty of the original product. This warranty extends only to the original purchase and is not transferable unless authorized in writing by Quantum Medical Imaging.

Products manufactured by parties other than QMI, where QMI acts solely as distributor or reseller, will carry their respective manufacturers' warranties.

WARRANTY EXCLUSIONS

The foregoing warranties are exclusive and in lieu of all other warranties, whether written, oral, express, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. QMI Warranty is exclusive of:

1) Failure of Buyer/Dealer to prepare the site or provide power requirements or operating environmental conditions in compliance with any applicable instructions or recommendations of Quantum Medical Imaging.
2) Failure of Buyer/Dealer to provide the proper incoming power required to support the equipment in accordance with the recommendation of QMI.
3) Any modification of product performed by a party other than Quantum Medical Imaging.
4) Combining incompatible products.
5) Improper or extraordinary use of the Product, improper maintenance of the Product, or failure to comply with any applicable instructions or recommendations of Quantum Medical Imaging.
6) Misuse, tampering or, negligent storage/handling of the Product by Buyer, its employees, agents or contractors.
7) Fuses and other items deemed by QMI to be expendable.
8) Acts of God, acts of civil or military authority, fires, floods, power failure or electrical power surges, strikes or other labor disturbances, war riots or other causes beyond the reasonable control of Quantum Medical Imaging.
9) Installation, troubleshooting or repair service are not included in this warranty. Technical service and maintenance is the responsibility of the dealer selling the equipment.
10) The Manufacturer is relieved of any responsibility for damage during shipment after the freight carrier transports the unit for delivery.

BUYER'S REMEDIES

If Quantum Medical Imaging determines that any Product fails to meet any warranty during the applicable warranty periods, Quantum Medical Imaging shall correct any such failure as follows:

A) By repairing, adjusting, or replacing any defective or non-conforming Parts or Products.
B) By making available any necessary repaired or replacement parts or assemblies.

Quantum Medical Imaging shall have the option to furnish either new or exchange replacement parts or assemblies. All returned parts shall become the property of Quantum Medical Imaging.

The preceding Paragraphs set forth Buyer's Remedies and Quantum Medical Imaging's sole liability for claims based upon failure of the product to meet any warranty, whether the claim is on contract, warranty, Tort (including negligence and strict liability) or otherwise, and however instituted. And upon the expiration of the applicable warranty period, all such liability shall terminate. In no event shall Quantum Medical Imaging be liable for special or consequential damages.

The warranties and remedies available to the buyer are conditioned upon all claims under this warranty being made in accordance with the aforementioned warranty statement.

Warranty Information

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Chapter 1

INTRODUCTION

Chapter 1 Introduction

OVERVIEW

This manual provides information for installing, operating, and maintaining Quantum Medical Imaging's Floor-to-Ceiling/Wall Tubestand, Model QS-500 (hereinafter referred to as the Tubestand). It is imperative that all safety procedures described in this manual be strictly adhered to in order to ensure the safety of both patient and user.

NOTE

The user should read this manual in its entirety prior to using this equipment. It should be kept in a location near the equipment and readily accessible to the those that operate it.

The key features of the Model QS-500 Tubestand are as follows:

- Vertical travel 56.0 inches (1422.4 mm), longitudinal travel 96.0 inches (2438.4 mm) using a 10' floor track
- Less than 14 inch (355.6 mm) focal spot-to-floor distance
- Floor-to-wall mounting option (using optional Wall-mount tracks)
- Electromagnetic locks for vertical (fail-safe), longitudinal and angulation Tubestand motions
- 40" and 72" SID indicators (metric equivalents available) on handgrips and vertical column (40") and floor track (72")
- Tube angle display
- Tube/collimator positioning handgrips provide lock release buttons for quick tube positioning

INTENDED USE

The Floor-to-Ceiling/Wall Tubestand (Model QS-500) is intended for use as a support structure used to position a diagnostic x-ray tube housing assembly for a medical radiographic procedure.

MAIN COMPONENTS

See Figure 1. The Model QS-500 Tubestand contains:

1 X-Ray Tube

2 Handgrips

3 Wall/Ceiling Track

4 Support Arm

5 Vertical Column

6 Serialization Label

7 Base Assembly

8 Floor Track

9 Collimator

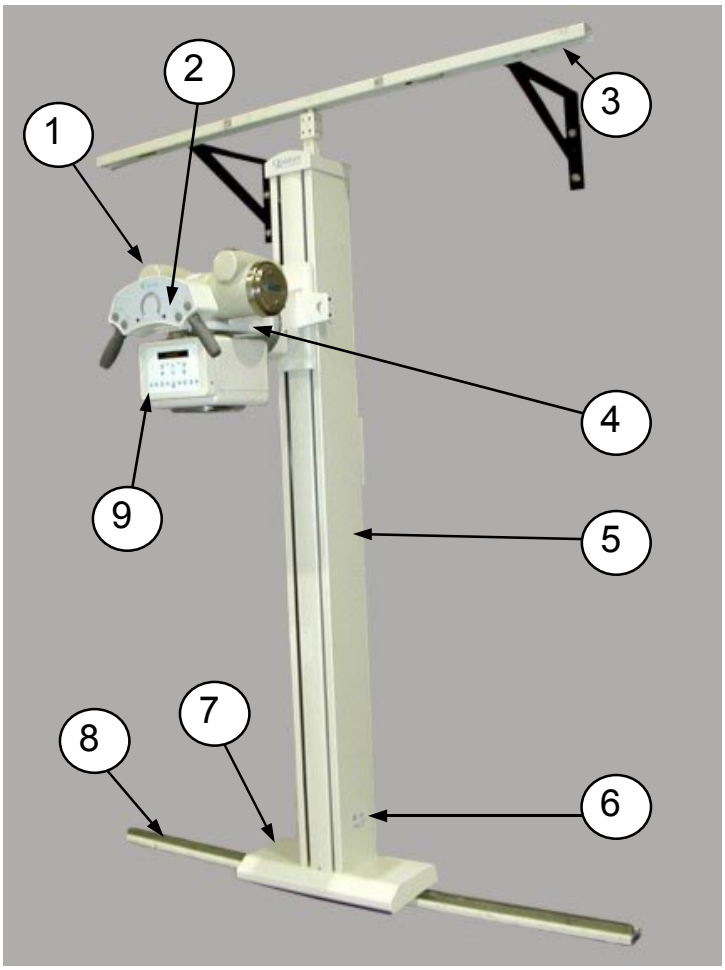

Figure 1. Floor-to-Ceiling/Wall Tube Stand, Model QS-500 Series

Chapter 2

SPECIFICATIONS

PHYSICAL SPECIFICATIONS

The following are physical specifications for the Tubestand (see Figure 2):

System Specifications

- Column Height: 85.0 inches (2159.0 mm)
- Vertical Travel (x-ray tube): 60.5 inches (1536.7 mm)
- Tubestand Longitudinal Travel:
  6' Track = 48.0 inches (1219.2 mm)
  8' Track = 72.0 inches (1828.8 mm)
  10' Track = 96.0 inches (2438.4 mm)
- Tube Angulation: 270° (±135°)
  Detents at 0°, 90°(CW), 90° (CCW)
- Counterbalancing: Counterweight (trim weight adjustable)
- Minimum Focal Spot-to-Floor Distance: 13.75 inches (349.0 mm)
- Collimator compatibility: Manual , Selectable or Automatic, 10-20 lbs. (typical). Mounting to fork/ tube housing requires four 1/4-20 or M6 x 16 bolts spaced on a 3.625" diameter circle
- Tube Compatibility: 3" or 4" rotating anode type, 30-40 lbs. (typical)
- Overall Weight: 508.0 lbs. (230.4 kg)

Chapter 2 Specifications

Electrical Specifications

- Mode of Operation: Continuous
- Input Power: +24 VDC @ 1.0 Ampere

Note: The following specifications are for the Tubestand only and do not apply to the x-ray tube or collimator. Refer to x-ray tube and collimator manufacturer's documentation (supplied with the Tubestand) for related specifications.

- Power Supply Type: Double (or Reinforced) Insulated (must meet construction/performance criteria per UL 2601-1)
- Electrical Interfacing: Tubestand-mounted terminal strip for interfacing +24 VDC, tray sensing signals (with automatic collimator only)

Handgrip Specifications

- Controls: Vertical, Longitudinal, Angulation, All Locks Release
- LED Indicators: 40" (100 cm) SID, 72" (180 cm) SID
- LCD Display (on systems equipped with digital handgrips only): 40" (100 cm) and 72" (180 cm) SID, tube rotation angle, date, time, x-ray generator technique selection when APR mode is activated (or mode [i.e., AEC/MANUAL] when not in APR mode)
- Angle Indicator Display (on systems equipped with analog handgrips only): Bubble type

Room Construction

- A conventional radiographic room construction should be used in the area where the Tubestand is to be installed.
- Consult with your State Health Department or local Building Codes for specific radiation shielding requirements.

Other Specifications

- Options: 6-, 8-, and 10-foot floor track lengths, custom lengths available (special order)

  Wall-Mount Brackets

PERFORMANCE SPECIFICATIONS

The following are performance specifications for the Tube Stand:

System Operating Environment

- Ambient Temperature: +10°C to +40°C
- Relative Humidity: 20 to 80%, non-condensing
- Altitude: -30.5 to +2440 meters relative to sea level

Non-Operating Environment

- Ambient Temperature: -18°C to +70°C
- Relative Humidity: 20 to 95%, non-condensing
- Altitude: -30.5 to +3048 meters relative to sea level

COMPATIBILITY STATEMENT

The Quantum Medical Imaging, LLC Tubestand is compatible with all Quantum Medical Imaging, LLC manufactured tables, wall stands and high-voltage x-ray generators, and with other manufacturer's equipment having equivalent means for indication of SID and perpendicularity.

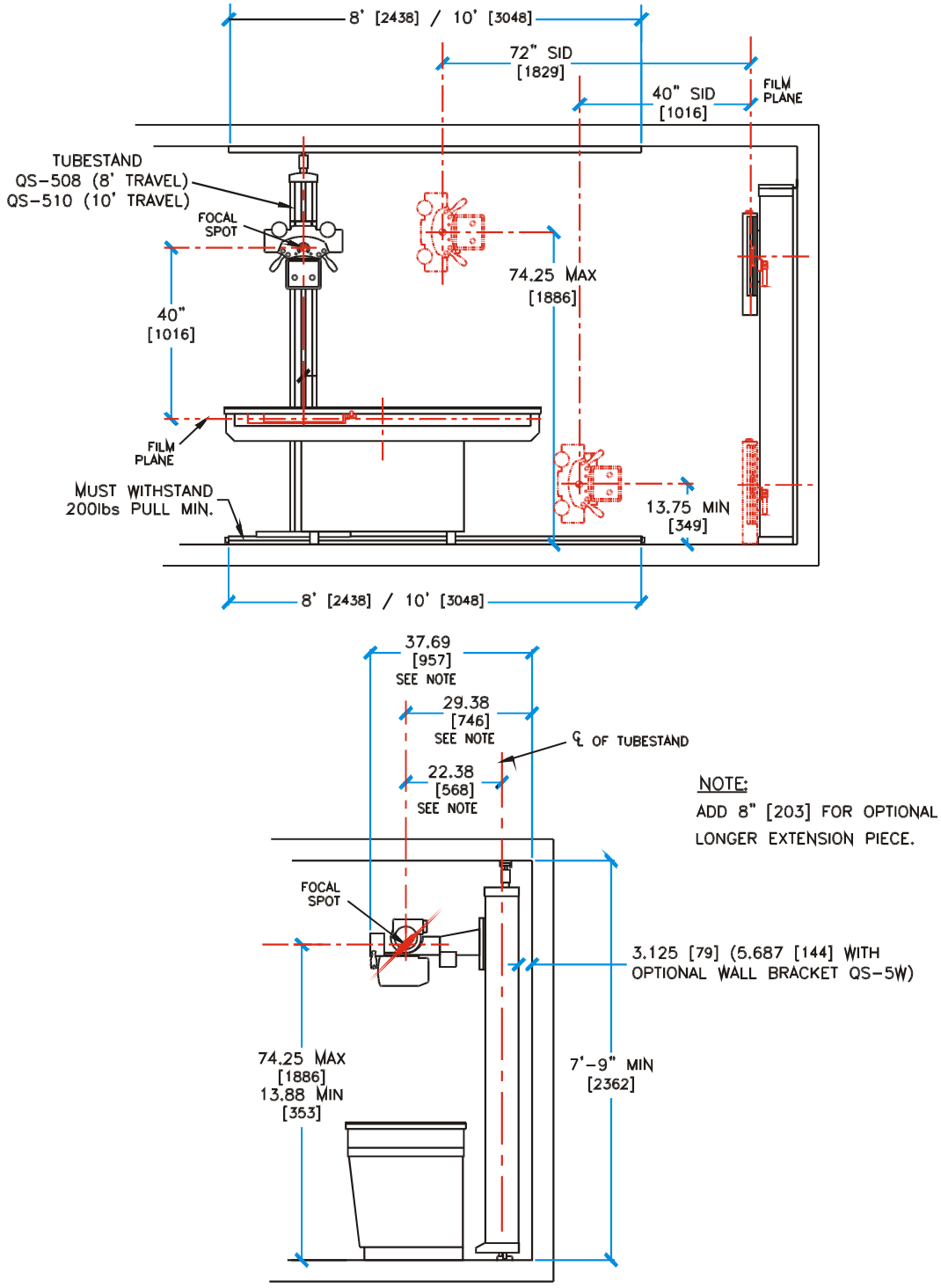

Figure 2. Model QS-500 Tubestand Dimensions

Chapter 3

ASSEMBLY & INSTALLATION

Chapter 3 Assembly & Installation

OVERVIEW

This chapter describes the steps required to assemble and install the Model QS-500 Tubestand, including making all required electrical connections, and performing all required alignments and calibrations.

NOTE

Examine all cartons and crates carefully at time of delivery. If damage is apparent, have delivery driver write a "Damaged Shipment Note" on copies of freight bill, sign it, and file appropriate carrier claim. Should you discover concealed damage, immediately notify the transporting agent and ask for an "Inspection of Damage". Carrier will not accept concealed damage claim if filed after 15 days from date of receipt of merchandise.

ROOM CONSTRUCTION

A conventional radiographic room construction should be used in the area where the Tubestand is to be installed. Consult with your State Health Department or local Building Codes for specific radiation shielding requirements.

INSTALLATION PRECAUTIONS

Do not remove counterweight locking bolt (shipping bolt) until instructed to do so.

Check that the space location, conduit arrangements, and electrical junction boxes are prepared for the permanent installation of the Tubestand. Verify that the location and space allowed is sufficient for the full range of Tubestand travel motions without interfering with walls or structures in the room (see Figure 2 for system dimensions). Note that the minimum distance between the rear wall and the back surface of the Vertical Column is 3.2 inches (79 mm) with a ceiling-mounted Tubestand, and 5.7 inches (144 mm) with a wall-mounted Tubestand.

Install the Tubestand before installing the table.

CDRH CERTIFICATION

The Tubestand is not a CDRH certifiable product. However, it must be compatible and operate in conjunction with other components in the x-ray system so that the x-ray system performs in compliance with CDRH performance standards.

REQUIRED TOOLS AND MATERIALS

The following tools and materials are required to complete the assembly and installation procedures:

- Drill and drill bits (masonry bit if concrete construction)
- Double bubble level (min. 24 inches in length)

Chapter 3 Assembly & Installation

- Tape Measure (eight feet minimum length)
- Standard hand tools
- Alcohol (to clean the high-tension cable ends and tube head)
- Dow-Corning DC4 vapor-proofing compound, silicon insulating grease or equivalent - for packing x-ray tube head and high-tension cable terminals
- Special film cassette (11" x 14" cassette with scribed centerline)

UNPACKING

The Tubestand is shipped in a single shipping container, which includes the following major items:

- Vertical Column with attached Base and Support Arm
- Top Track and Bottom Track
- Tube Support Bracket, and Hand Grips
- Manual, hardware bag, SID scales, cables, etc.

Open the crate or carton marked "packing list enclosed" first. Locate and remove the packing list. Do not dispose of packing material until packing list is matched with actual parts received. If any damaged parts are found, notify the shipping or freight company immediately (the manufacturer is relieved of any responsibility for damage during shipment after unit is picked up by the carrier). Should there be a shortage of parts, notify Quantum Medical Imaging's Service Department.

INSTALLATION INSTRUCTIONS

When the Tubestand is used with a vertical wall frame or stand, care should be taken during room planning and pre-installation to allow for the accurate alignment of these components. Alignment accuracy must be within 2% of the SID used. After the Tubestand's floor track is aligned with the table receptor, the tracks cannot be adjusted transversely. Therefore, transverse alignment of the x-ray field to the image receptor in the wall frame or stand must be made by adjusting the position of the image receptor on the stand or relocation of the entire stand.

NOTE

Install the Tube Stand before installing the table.

All mounting procedures must be approved before, and checked after, installation by the hospital or facility engineering department and a registered, professional, structural engineer. It is recommended that a leakage current measurement be taken following installation to verify system meets allowable levels.

To assemble and install the Tubestand, refer to Figures 3 through 19 and proceed as follows:

Top Track Installation

1. Place the Top Track, with attached mounting brackets, in the proper mounting location on the wall or ceiling and mark the mounting hole locations.
2. Remove the Top Track and drill holes.
3. Secure the Top Track to wall or ceiling using appropriate fasteners depending on site construction (capable of supporting 500 lbs. pull-load).

Floor Track Installation

The area of the floor on which the Floor Track is to be mounted must be level in all directions. Shims may be used, however, grouting is recommended.

1. Place track on floor in mounting location.
2. Place bubble level on the track to check that it is level both longitudinally and laterally.
3. If necessary, shims can be used to level appropriately.
4. Do not anchor the Floor Track to floor until after "Vertical Column Angle Adjustment" procedure is performed.

NOTE

When installing the Tubestand, extreme care must be taken not to tip over the Base and Tube Stand Column. The Base and Tube Stand Column should not be left standing unattended at any time. Install Top Trolley Wheel immediately once the column is raised.

Vertical Column/Base Installation

1. Remove the shipping bolt located in the Tubestand Base (see Figure 3).
2. Remove the Stop Bumpers from the Top Track and Floor Track at the end of the track where you will be sliding in the Tubestand.
3. Raise the Vertical Column and slide the bearing assemblies (in the Base) onto the Floor Track (see Figure 4). Carefully support the column or lean it against wall.
4. Stand the Vertical Column upright and measure the distance between the top Pulley Wheel Assembly (i.e., the top of the Vertical Column) to the inside edge Top Track channel.
5. The measurement made in the previous step is the required length of the Top Trolley Wheel and Top Trolley Extension, when assembled together (minus the height of the Top Trolley Wheel). (See Figure 5.)
6. Loosely install the Top Trolley Wheel on top of the Top Trolley Extension to determine how much must be cut off the Top Trolley Extension to properly

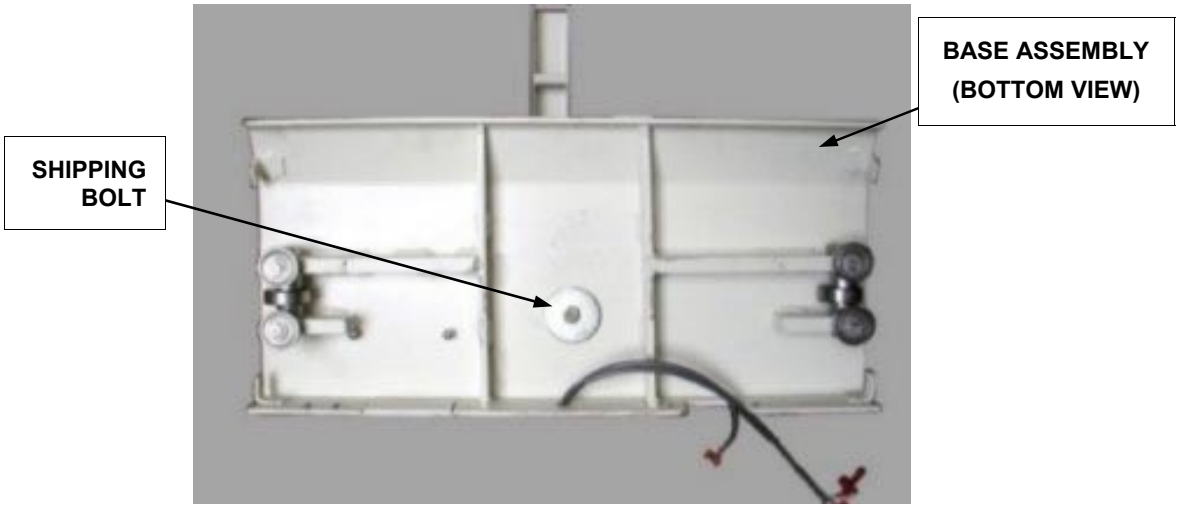

Figure 3. Removing the Shipping Bolt

fit the Top Trolley Wheel in the Top Track.

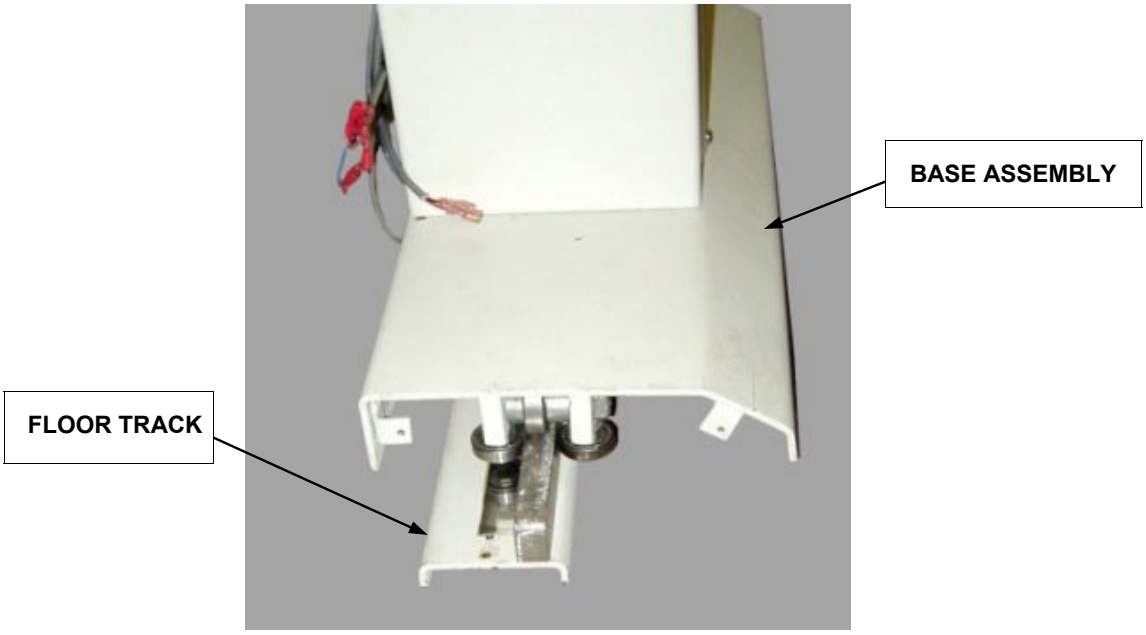

Figure 4. Tubestand Installed on Floor Track

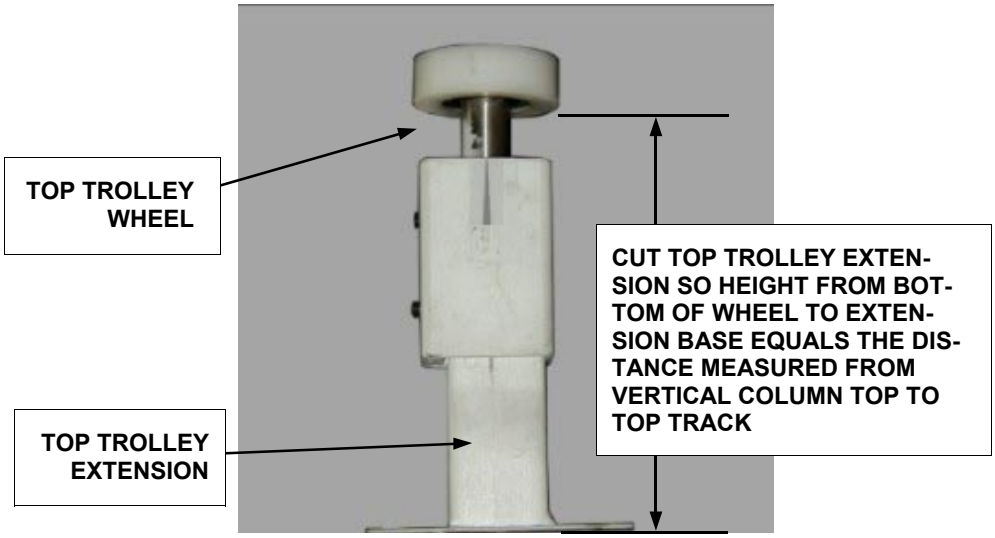
TOP TROLLEY WHEEL
CUT TOP TROLLEY EXTENSION SO HEIGHT FROM BOTTOM OF WHEEL TO EXTENSION BASE EQUALS THE DISTANCE MEASURED FROM VERTICAL COLUMN TOP TO TOP TRACK
TOP TROLLEY EXTENSION

Figure 5. Measuring and Cutting the Top Trolley Extension

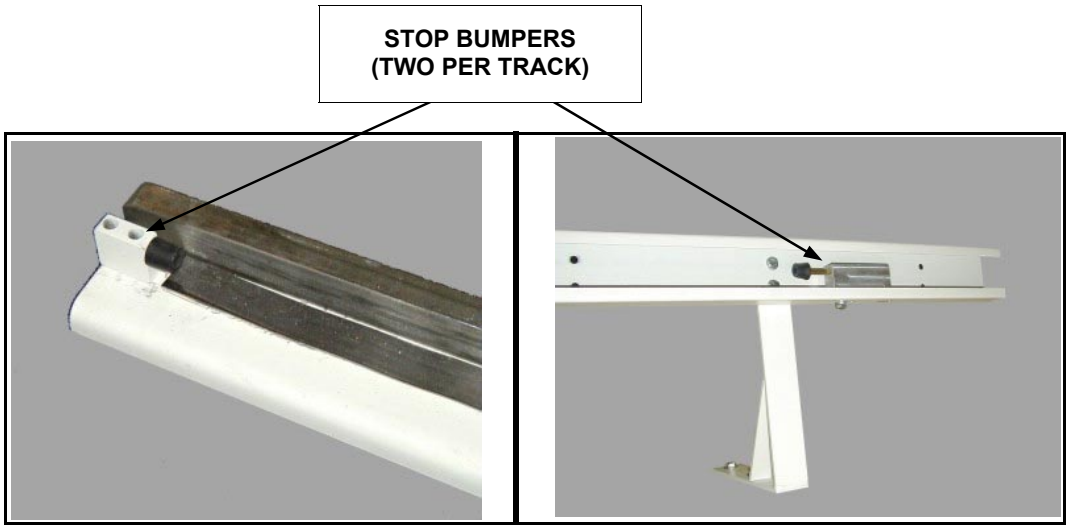

Figure 6. Floor Track and Top Track Stop Bumpers

7. Remove the Top Trolley Wheel from Extension and cut the Top Trolley Extension to correct length.
8. Insert the Top Trolley Wheel in the Top Track and secure it to the Top Trolley Extension by tightening the eight (8) set screws (four on left side, four on rear side).
9. Mount Top Trolley Wheel and Top Trolley Extension to Vertical Column using four (4) 1/4-20 x 3/4" hex head bolts and lock washers.

10. Check for proper position of Top Trolley Wheel. If necessary, loosen eight (8) set screws and adjust the position of the Top Trolley Wheel up or down as required. Re-tighten all set screws when finished.
11. Re-install Track Stop Bumpers in Floor Track and Top Track (see Figure 6).

Installing the Longitudinal Brake (Electromagnetic Lock)

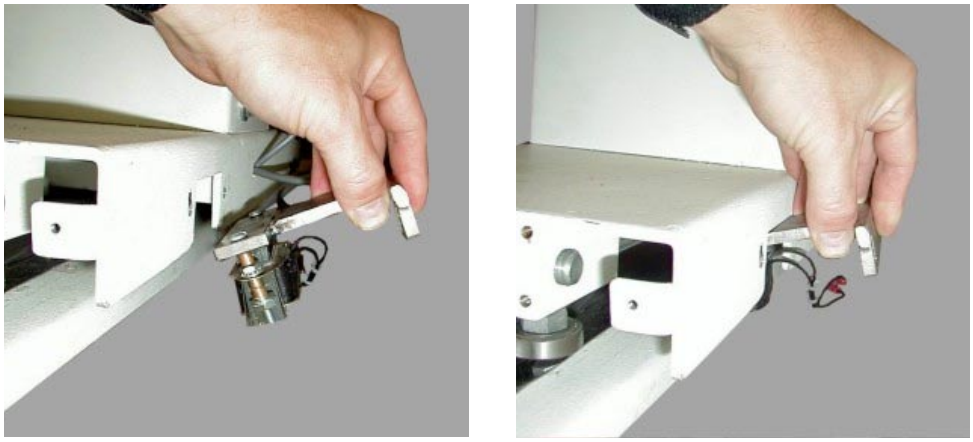

Figure 7. Installing the Longitudinal Brake Assembly

The Longitudinal Brake Assembly mounts inside the Base Assembly (on the anode side). Proceed as follows:

1. Insert the Longitudinal Brake Assembly into the slot located in the rear side of the Base Assembly (see Figure 7).
2. Loosely mount the Longitudinal Brake Assembly to the Base Assembly using two (2) 1/4-20 x 1" hex head bolts and flat washers.
3. The space between electromagnetic lock and contacting part of the Floor Track should not exceed 20/1000" (ideally between 10/1000" and 20/1000"). Adjust height as required.
4. When electromagnetic lock height is correct, tighten the two (2) 1/4-20 x 1" hex head bolts.

Vertical Column Angle Adjustment

1. Place a double-bubble level, two feet in length minimum, on the front of the Vertical Column (see Figure 8).

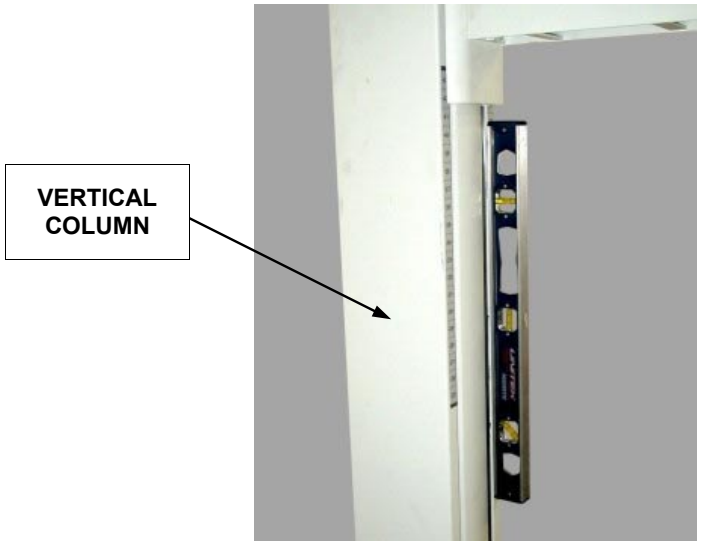

Figure 8. Checking the Tubestand Vertical Angle

2. If not level, adjustment can be made by moving the Floor Track in or out from wall. Ensure the Vertical Column is level throughout the full length of longitudinal travel.
3. Secure the Floor Track to floor using appropriate fastening devices (depending on floor construction), each capable of supporting 200 lbs. pull-load.

Installing the X-Ray Tube, Collimator and Handgrips

CAUTION! The angulation lock is not a mechanical lock; electrical power must be applied to hold angulation. During installation of the x-ray tube, collimator and Handgrips, the assembly must be held to prevent free-turning. Mount the collimator as per the specific instructions supplied by the collimator manufacturer.

1. Position the Tube Support Bracket on the Support Arm, with the top two slots centered on mounting holes, and secure using four (4) 1/4-20 x 1-1/4" socket head cap screws and washers (see Figure 9).

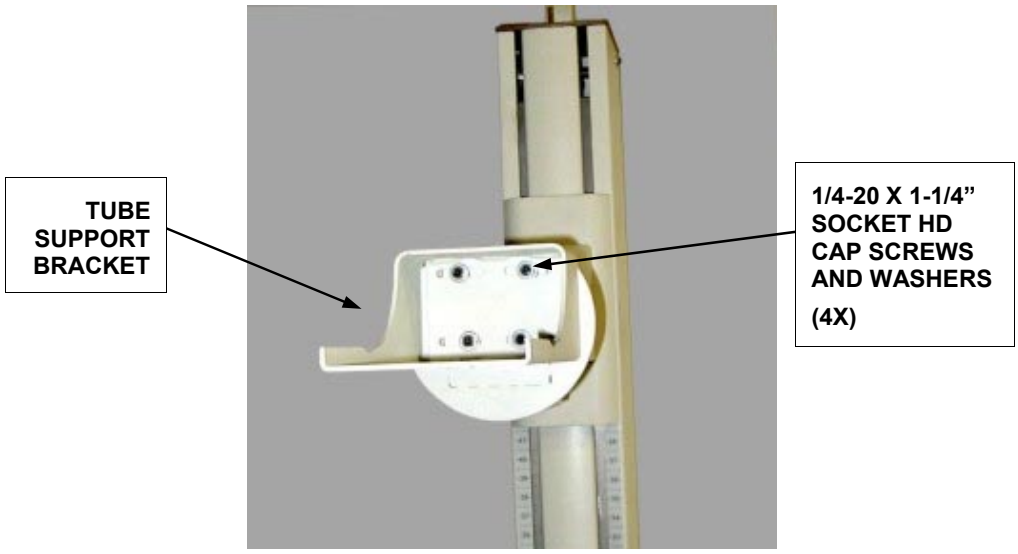

Figure 9. Mounting the Tube Support Bracket

2. Remove Collimator Mounting Plate from collimator and install Collimator Mounting Plate (with appropriate spacers, supplied with collimator) and x-ray tube on Tube Support Bracket (see Figure 10).
3. Mount the Handgrip Assembly (in front of the x-ray tube) using four (4) 1/4-20 hex head screws (see Figure 11).
4. Install collimator on Collimator Mounting Plate.
5. Route Handgrip cable (from terminal block TB1) to D-connector on rear side of the Handgrip Assembly and connect.

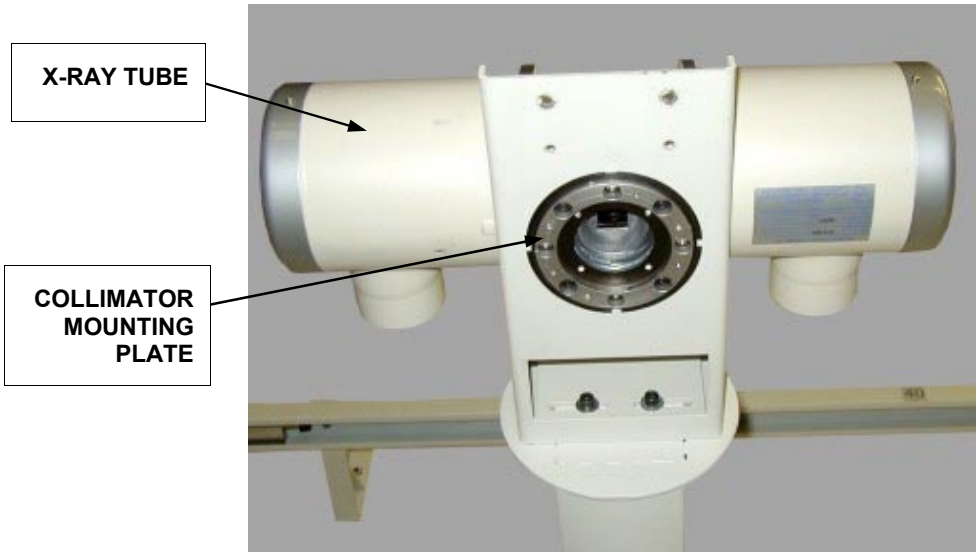

Figure 10. Tube and Collimator Mounting Plate Installed

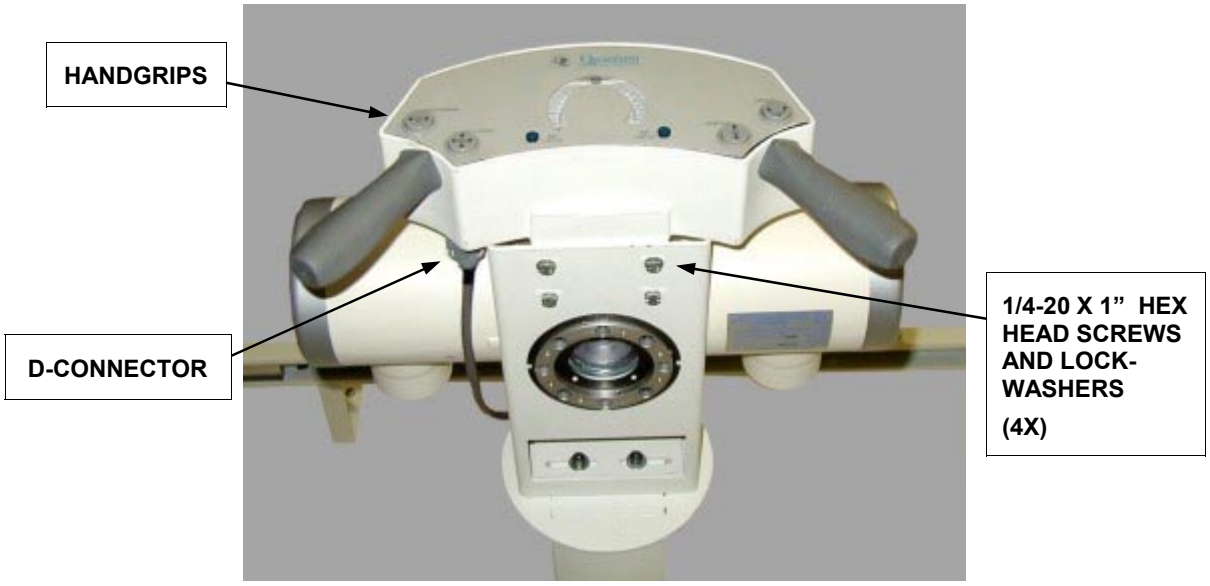

Figure 11. Handgrips Installed

Leveling Support Arm (Standard Equipment Support Arms)

1. Verify that Support Arm is level as shown in Figure 12. If Support Arm is not level (±1.0°), verify that the Floor Track and Tubestand are level.
2. If Floor Track is level, then level Support Arm/Transverse Arm as follows:

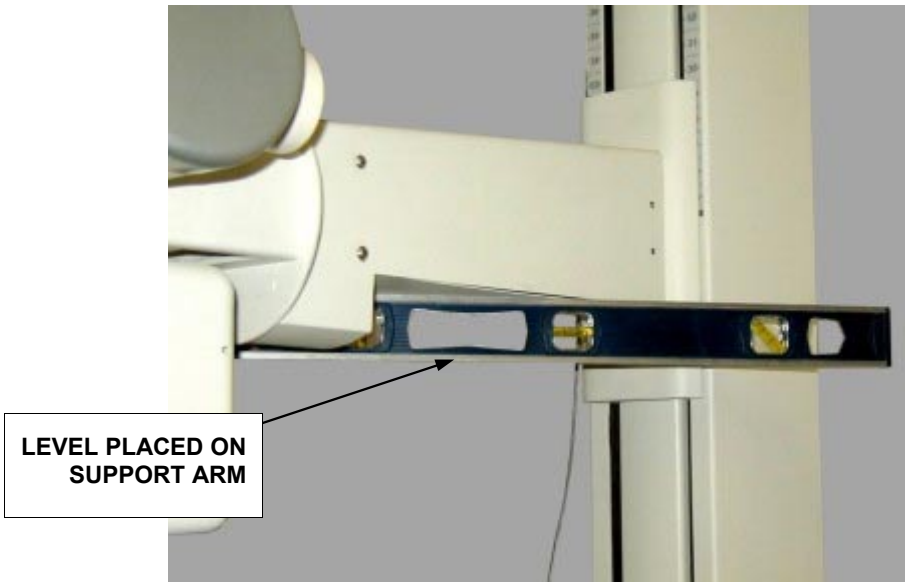

Figure 12. Checking Collimator/Tube Arm Extension Level

a. Loosen four (4) 3/8-16 x 1" hex head cap screws securing Support Arm to Vertical Trolley (see Figure 13).
b. Adjust set screws as required to level arm and collimator.
c. Re-tighten four (4) 3/8-16 x 1" hex head cap screws.

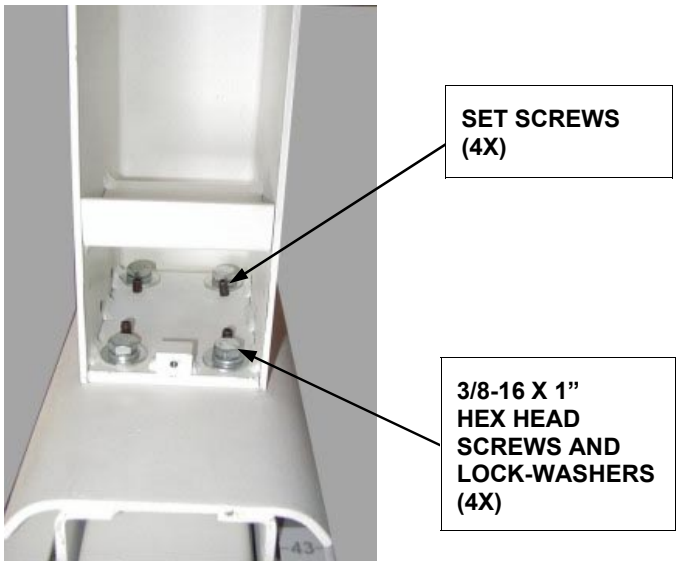

Figure 13. Tube Arm Extension Leveling Screws

Counterweight Balancing Instructions

1. Verify the counterweight is balanced properly so it provides a smooth up and down motion of the tube head.
2. If additional weights are necessary, add trim weights at the rear side of the Vertical Column (see Figure 14).

NOTE

Be careful not to drop trim weights when adding through access opening.

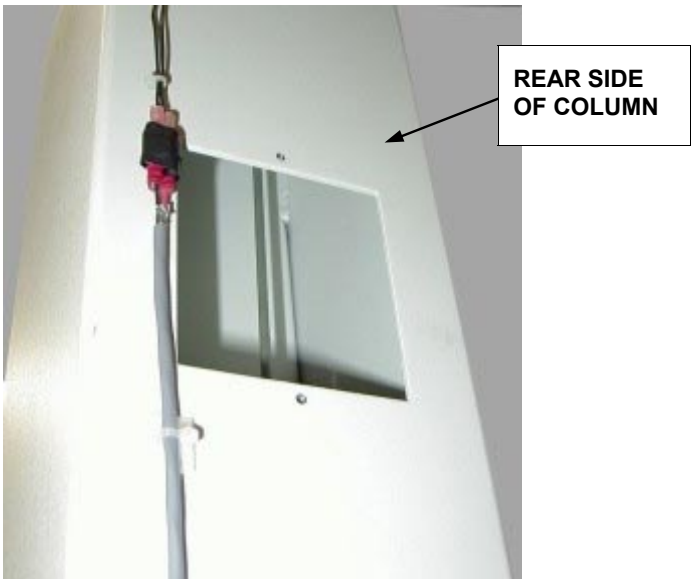

Figure 15. Trim Weight Access Opening (Back of Tubestand)

Horizontal SID Switch Assembly Installation

The Horizontal SID Switch Assembly mounts inside the Base Assembly (on the cathode side) as shown in Figure 15. Proceed as follows:

1. Loosely mount the Horizontal SID Switch Assembly to the Base Assembly using two (2) 10-32 x 1/2" socket head cap screws and flat washers.
2. Using a switch actuator placed on the Floor Track as a reference (do not peel off adhesive backing at this time), adjust the height of the switch so that when it contacts the actuator, the switch activates (clicks).
3. When switch height is correct, tighten the two (2) 10-32 x 1/2" socket head cap screws.

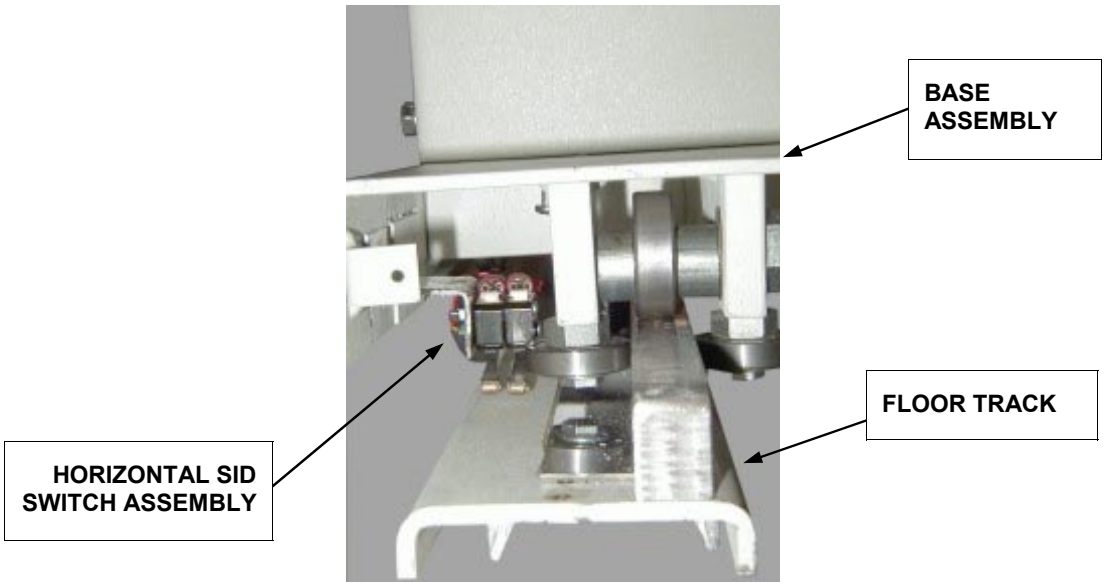

Figure 15. Horizontal SID Switch Installed

Vertical SID Switch Assembly Installation

The Vertical SID Switch Assembly mounts to the lower section of the Cable Clamp (on the anode side) as shown in Figure 16. Proceed as follows:

1. Install two (2) Cable Clamp lower sections on each side of Support Arm using two (2) 1/4-20 x 2" socket head cap screws.
2. Loosely mount the Vertical SID Switch Assembly to the lower section of anode-side Cable Clamp using two (2) 10-32 x 1/4" socket head cap screws.
3. Using a switch actuator placed on the Vertical Column as a reference (do not peel off adhesive backing at this time), adjust the height of the switch so that when it contacts the actuator, the switch activates (clicks).
4. When switch height is correct, tighten the two (2) 10-32 x 1/4" socket head cap screws.

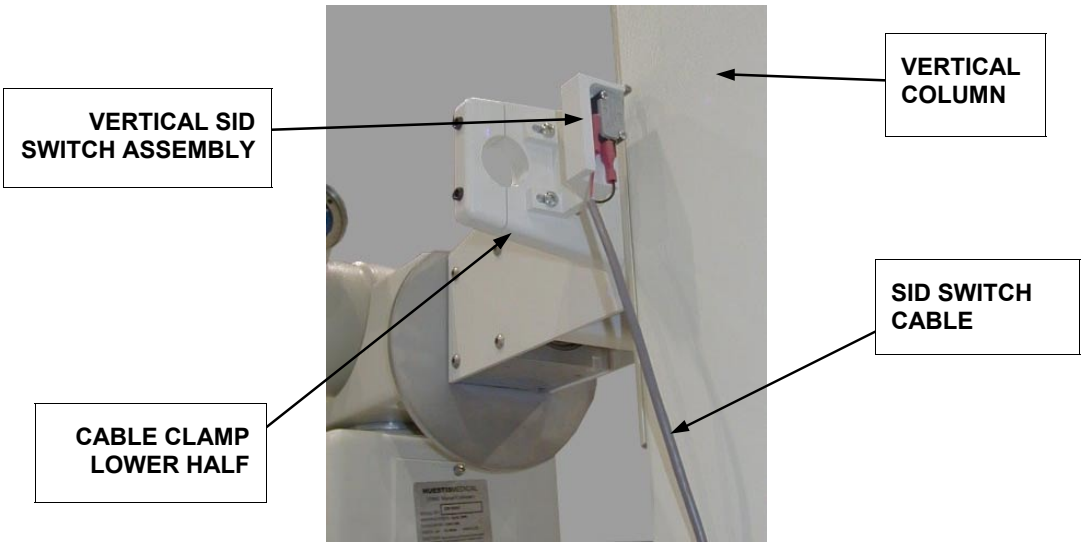

Figure 16. Vertical SID Switch Installed

Tubestand Input Power

The Tubestand requires a +24 VDC power input. The +24 VDC power source must be double (or reinforced) insulated and meet construction/performance criteria per UL 2601-1.

Connect the +24 VDC input to terminal board TB1-1, and the +24 VDC RTN input to TB1-2 (refer to Tubestand Interconnect Diagram, Figure 17). Terminal strip TB1 is located on the rear side of the Vertical Column.

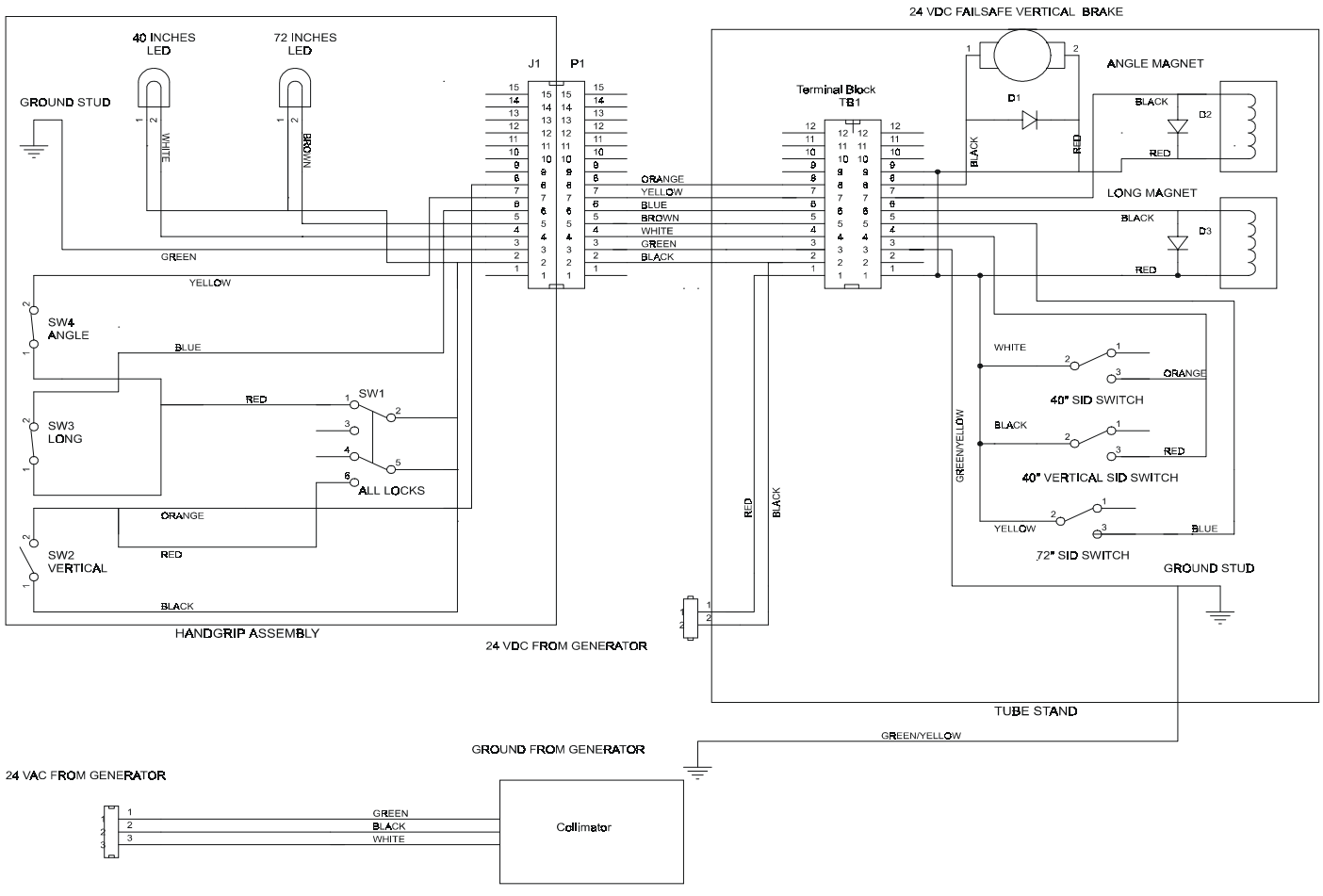

Figure 17. Tubestand Interconnection Diagram

Connection of the High-Voltage Cables/Cable Routing

1. Install the Anode and Cathode terminals to the x-ray tube housing. Allow sufficient cable drape (see Figure 18) in order to angulate the x-ray tube 90 degrees in either direction.
2. Fasten the cables into the cable clamps on the Vertical Trolley, along with the cables from the collimator, Handgrip Assembly, Angulation Lock Assembly and Vertical SID Switch Assembly by installing upper halves of Cable Clamps to lower halves using two (2) 8-32 x 1" socket head cap screws.
3. From the Vertical Column, drape the cables with the +24 VDC power supply cable, to the x-ray generator.

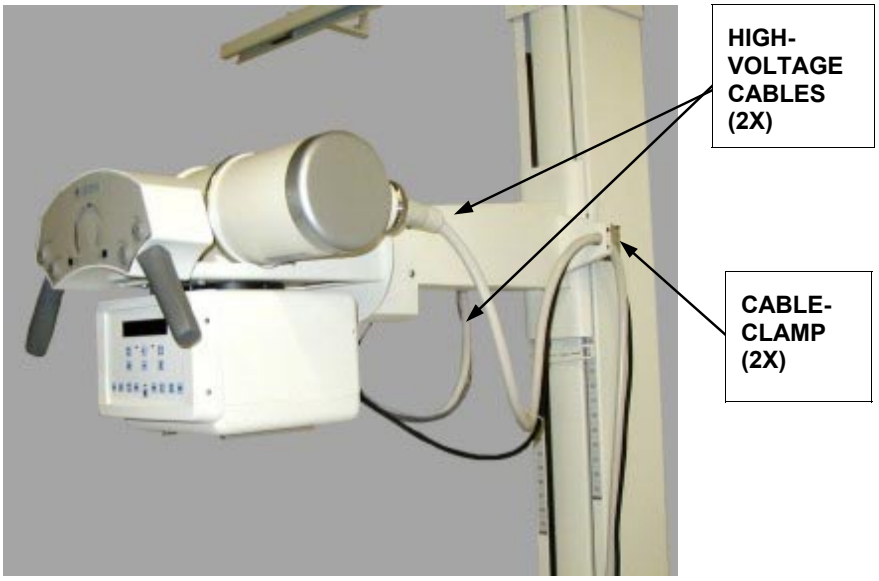

Figure 18. Cable Clamping and Management

Horizontal SID Switch Actuator/Indicator Installation

Install the Horizontal SID switches actuators and indicator decals as follows:

1. Position the Tubestand at 40" and 72" SID and mark each position on Floor Track.
2. Clean marked area with alcohol and secure actuator in marked location using double-sided tape. Check switch height to ensure activation at 40" and 72" SID.
3. Affix 40" and 72" SID indicators on Top Track at each longitudinal (wall) SID position.

Vertical SID Switch Actuator Installation

The Vertical SID Switch actuating arm faces towards the Vertical Column.

1. Attach the Vertical SID Indicator Bracket to the bottom end of the Vertical Trolley. This is done by inserting the end of the bracket with square cut-out and slot into the opening between the trolley and Vertical Column. The square opening in the bracket is then hung onto the inside of the trolley. Pull down on bracket to ensure it is fully seated in slot.
2. Bring the Vertical Trolley down to the desired 40" SID mark on the Vertical Column.
3. Mark the location for the Vertical SID Switch actuator.
4. Clean marked area with alcohol and secure actuator in marked location using double-sided tape.
5. Check switch height to ensure activation at 40" SID.

Vertical Distance Scales Installation

The Vertical Distance Scales mount on the front side of Vertical Column (see Figure 19). The Vertical Distance Scales indicate the focal spot-to-film and focal spot-to-table top distance.

NOTE

Bucky and table SID measurements and markings are made separately and independently of each other.

Bucky SID

1. Set tube position to 40" (100 cm) bucky SID.
2. Affix label on column so the 40" (100 cm) mark lines up with the arrow in the bucky SID window of the SID Indicator Bracket.

Table SID

1. Set tube position to 40" (100 cm) table SID.
2. Affix label on column so that the 40" (100 cm) mark lines up with the arrow in the table SID window of the SID Indicator Bracket.

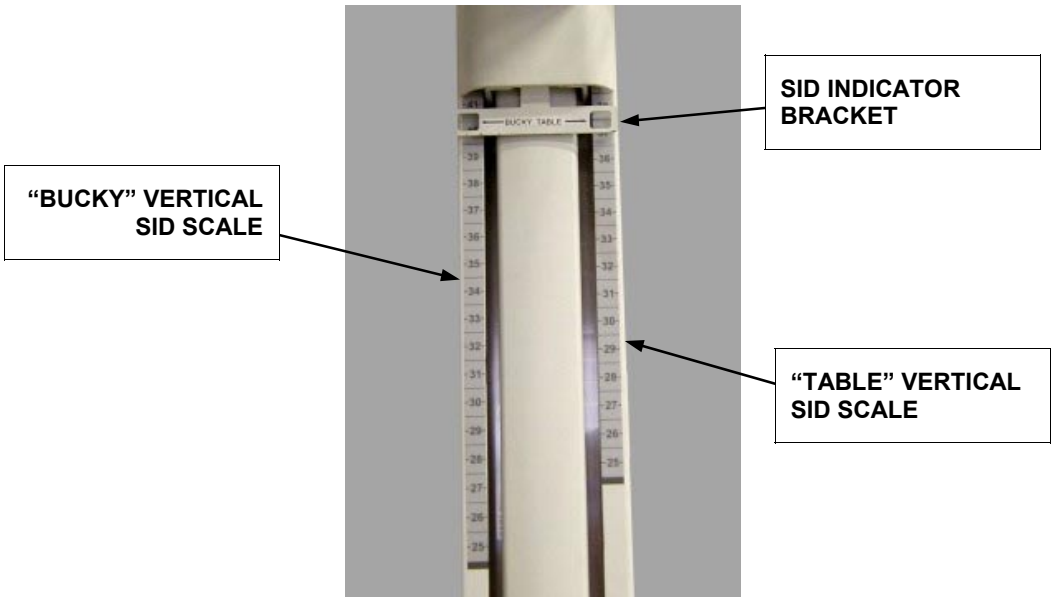

Figure 19. Vertical SID Scales Mounted on Vertical Column

ALIGNMENT OF THE SYSTEM

Once installed, the Tubestand must be aligned with other components of the x-ray system, such as a radiographic table and/or vertical wall stand. If both a radiographic table and vertical wall stand are used with the Tubestand, align the

table first, then the vertical wall stand. Alignment instructions are provided in the installation and operation manual provided with each component.

Refer to the collimator manual for additional alignments and performance verifications associated with beam limiting devices.

Collimator Light Field Versus Actual X-Ray Field

1. Using any size film with cassette, set the proper technique in the x-ray generator.
2. Make an exposure and develop the film to verify actual x-ray field versus collimator light field alignment is within required specifications.
3. Use collimator horizontal cross light to align the table. Rotate the x-ray tube to check the pitch adjustment as required.
4. Verify vertical movement and alignment with bucky stand or cassette holder using collimator light.

Chapter 4

OPERATION

TUBESTAND OPERATION

This chapter explains how to operate the Tubestand. Refer to Table 1 for descriptions and functions of the Tubestand's controls and indicators.

WARNING! All movable assemblies and parts of this equipment must be operated with reasonable care.

MOTIONS AND DETENTS

The Tubestand provides three manual motions, with mechanical detents for angulation at 0°, 90° (CW), 90° (CCW), and indicators for vertical (40") and horizontal (40" and 72") SID positions to aid in equipment positioning (see Figure 20):

1 Longitudinal travel (head-to-foot) of the Vertical Column

2 Vertical travel (SID adjust) of the Support Arm

3 Angulation of the X-Ray Tube/ Collimator

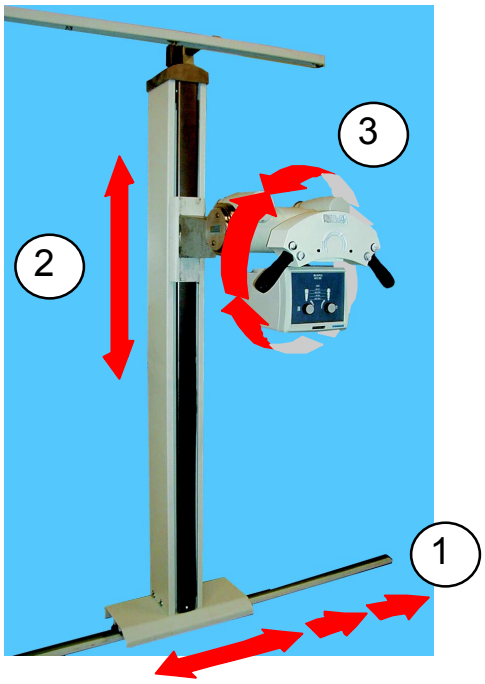

Figure 20. Model QS-500 Tubestand Motions

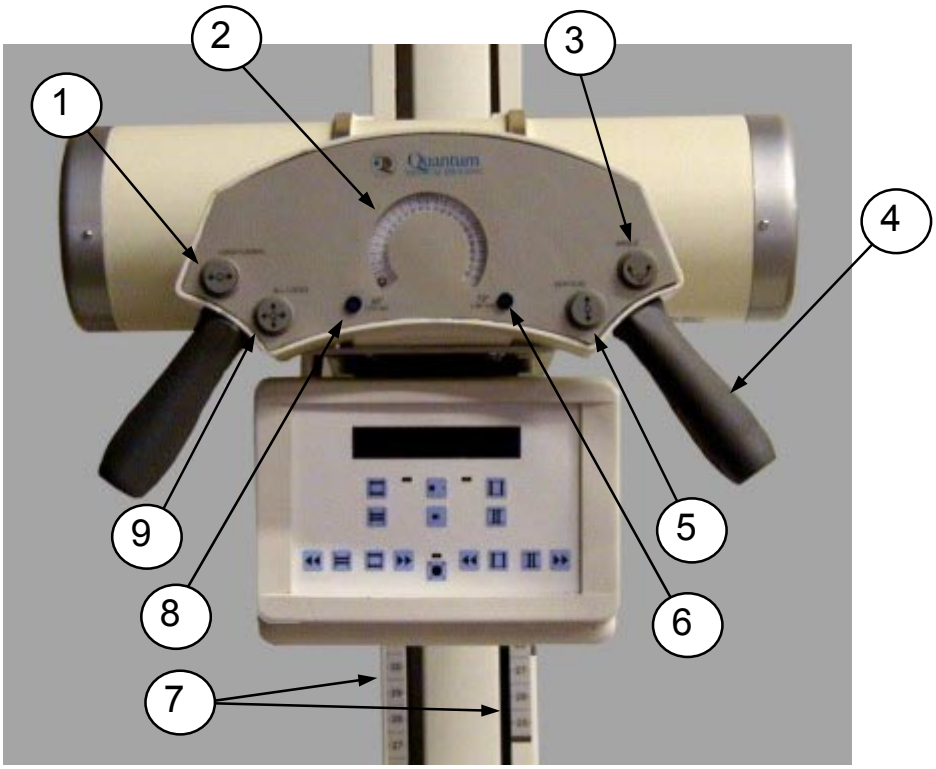

Figure 21. Model QS-500 Tube Stand Controls and Indicators

Table 1. Tubestand Controls and Indicators

Item	Title	Type	Description
1	Longitudinal Lock Release	Control	Releases magnetic lock to allow tubestand longitudinal motion along floor track.
2	Tube Angulation Display	Indicator	Indicates angle of tube rotation.
3	Tube Angulation Lock Release	Control	Releases magnetic lock to allow tube angulation.

Table 1. Tubestand Controls and Indicators (Continued)

Item	Title	Type	Description
4	Tubestand Handle	Control	Operator handle to aid in moving Tubestand.
5	Vertical Lock Release	Control	Releases magnetic lock to allow vertical tube motion.
6	SID at 180 cm or 72 in.	Indicator	Indicates SID is at 180 cm or 72 inches (Wall receptor only).
7	Source-to-Table Receptor and Source-to-Table Top SID Scale*	Indicator	Indicates distance from tube focal spot-to-table Film Cabinet cassette and tube focal spot-to-table top (metric or SAE units).
8	SID at 100 cm or 40 in.	Control	Indicates SID is at 100 cm or 40 inches (Wall or Table receptor).
9	All Lock Release	Indicator	Releases all tubestand magnetic locks to allow vertical, longitudinal, and tube angulation motions.

**Note for Elevating Tables only: Scale accurate only with table fully elevated (maximum height).*

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Chapter 5

MAINTENANCE

OVERVIEW

The Tubestand will function reliably when maintained according to the instructions provided in this chapter.

WARNING! Only properly trained service personnel should service or maintain this equipment. Failure to follow manufacturer's or service personnel's recommendations may result in serious injury.

USER MAINTENANCE

The equipment user is responsible for the basic cleanliness of the equipment. On a regular basis, painted metal surfaces should be cleaned using a clean cloth slightly moistened in warm soapy water (use mild soap). Wipe with a clean wet cloth.

CAUTION! Never use abrasive polish on this equipment.

PLANNED MAINTENANCE

Routine inspection and maintenance of the Tubestand should be performed by qualified service personnel on an annual basis.

WARNING! Personnel engaged in maintenance activities should exercise normal caution and care while working with electro-mechanical equipment. Before removing or opening any electrical power panels or covers, verify that the incoming power supply is turned OFF. In the event maintenance procedures require power to be supplied to the unit, extreme care MUST be exercised to insure the safety of service or other personnel in the area. Verify that the equipment is properly grounded before attempting any electrical operation.

Chapter 5 Maintenance

A complete series of inspections and functional checks was conducted at the time of installation to insure proper operation of the system. The following inspection and adjustment procedures are recommended to maintain the system in its original operating condition.

Perform Daily:

- Visually inspect for wear and cleanliness.
- Clean Tubestand exterior surface.

Perform Every Six Months:

- Check for evidence of loose hardware or loose wires.
- Check all bearings and bearing surfaces for cleanliness and corrosion.
- Clean Bearing Tracks, Floor Track, and Top (ceiling/wall) Track.
- Conduct a general inspection for worn or damaged parts.
- Check for proper counterbalancing and smoothness of vertical (up/down) Tubestand motion.

REPLACEMENT PARTS AND ORDERING INFORMATION

Table 2 provides a list of replaceable parts for the Tubestand. Figures 22 through 26 show the locations of the replaceable parts in the system.

ORDERING INFORMATION

To order replacement parts for the Tubestand, contact the Service Department at:

Quantum Medical Imaging, LLC
2905 Veterans Memorial Highway
Ronkonkoma, New York 11779
Phone: (631) 587-5800

Table 2. Replaceable Parts

ITEM	DESCRIPTION	PART NUMBER	QTY USED ON SYSTEM
1	SID Indicator, Blue	EL31-003	2
2	Pushbutton Switch, Longitudinal Lock Release	EL50-002-2	1
3	Pushbutton Switch, All Locks Release	EL50-002-3	1
4	Pushbutton Switch, Angulation Lock Release	EL50-002-5	1
5	Pushbutton Switch, Vertical Lock Release	EL50-002-6	1
6	SID Switch Actuator	ME10-218	2
7	SID Switch	C243002	2
8	Electromagnet, Rotational & Longitudinal	C201001	2
9	Fail-Safe Brake, Vertical Motion	EL80-002	1

When ordering replacement parts, supply the following information:

- Model and serial number of equipment
- Part number
- Part description
- Quantity required

When ordering components or parts not listed in Table 2, a complete description of the part, including its function and location should be provided with the model number and serial number of the unit.

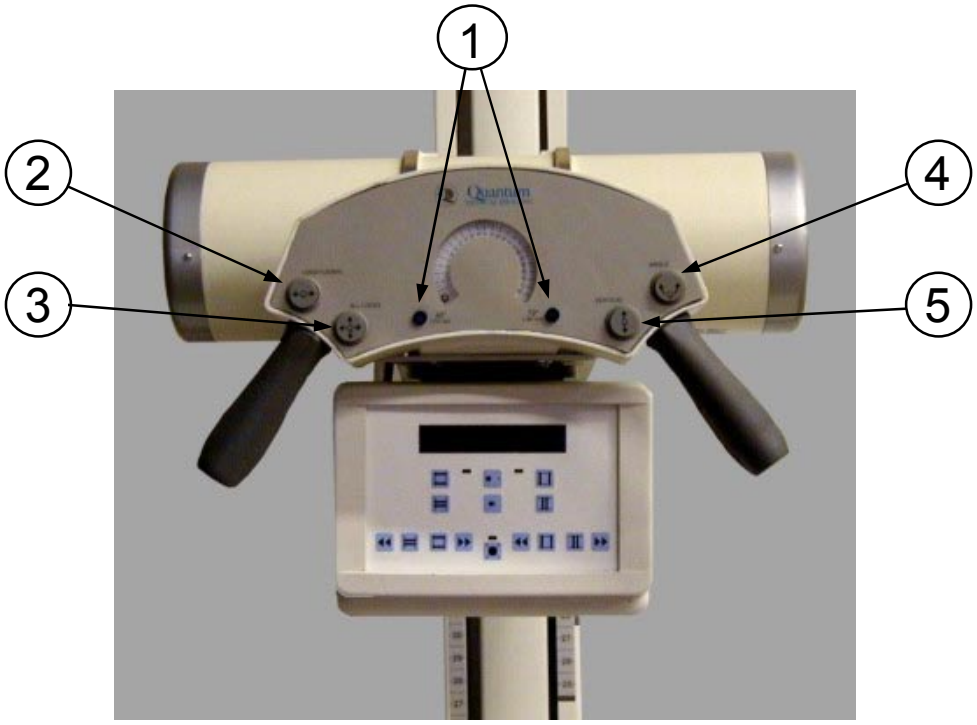

Figure 22. Model QS-500 Tubestand Parts Location Diagram

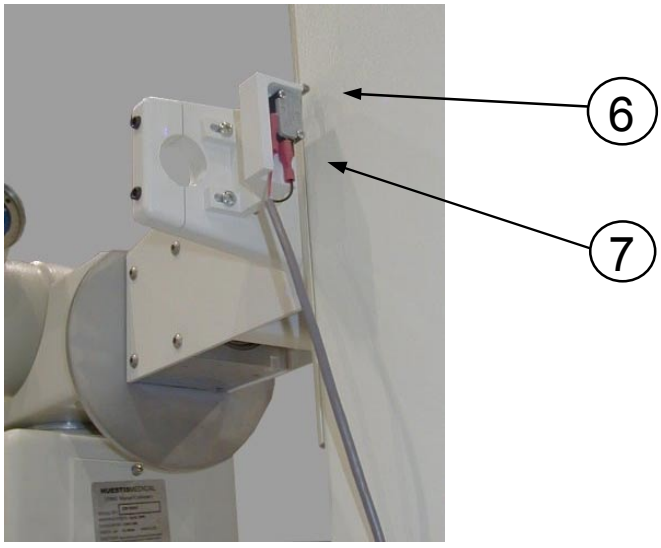

Figure 23. Model QS-500 Tubestand Parts Location Diagram

Note: Vertical SID switch and actuator are shown in Figure 23; Horizontal SID Switch, located in the Base Assembly, and longitudinal actuators have the same part numbers.

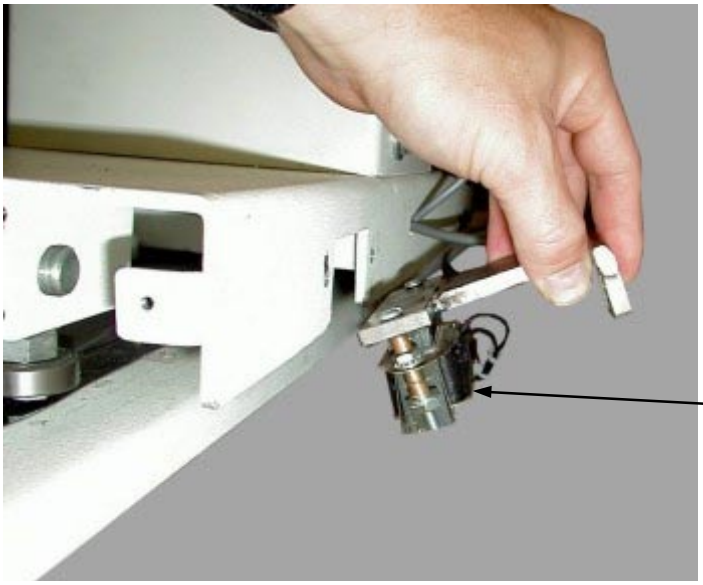

Figure 24. Model QS-500 Tubestand Parts Location Diagram

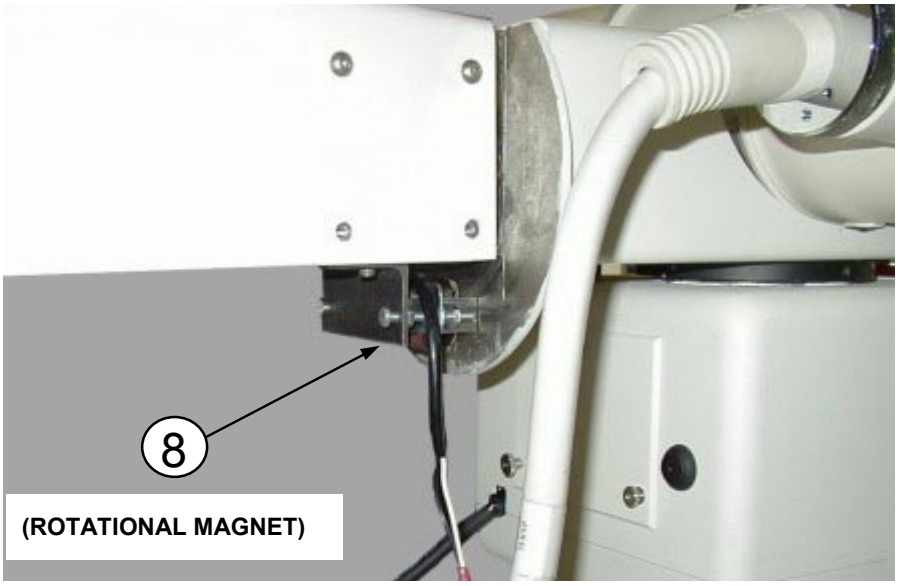

Figure 25. Model QS-500 Tubestand Parts Location Diagram

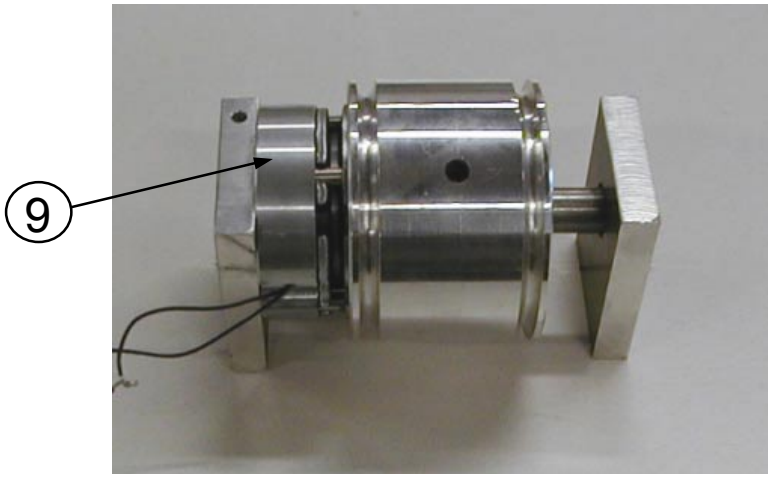

Figure 26. Model QS-500 Tubestand Parts Location Diagram